Original Research Article

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Correlation of Abnormal Cardiotocagraphy and Perinatal Outcome

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Abstract

Introduction: The intrapartum assessment of fetal well being has become an integral part of the management of labour. Now a day's cardiotocography (CTG) become a popular method to monitor fetal wellbeing. Objective of the study is the correlation of abnormal cardiotocography and perinatal outcome. *Material and Methods:* In this prospective observational study 200 pregnant women with gestational age ≥ 37 weeks gestation with cephalic presentation in first stage of labour were taken. Results were assessed in the form of mode of delivery, color of the liquor , apgar score, NICU admission and perinatal mortality. *Statistical analysis* was done by using Chi square test using software SPSS version 16 and $p<0.05$ is considered as statistically significant. *Results*: Out of total 200 patients the CTG tracing was normal in 152 patients (76%), abnormal in 18 patients (9%) and suspicious in 30 patients (15%). Caesarean section rate was statistically higher (72.2%) in abnormal CTG trace group as compared to those with suspicious (46.6%) and Normal (32.2%) group. Incidence of Meconium stained liquor was statistically higher (27.7%) in abnormal CTG trace group as compared to those with suspicious (13.3%) and Normal (4.6%) group. Incidence of babies with low apgar scores was statistically higher (27.7%) in abnormal CTG trace group as compared to suspicious (13.3%) and Normal (5.26%) group. Incidence of NICU admission was statistically higher (33.3%) in abnormal CTG trace group as compared to suspicious (10%). and Normal CTG trace group (1.31%). The abnormal CTG patterns of the present study had 11.11% perinatal mortality. *Conclusion*: Cardiotocography is the best non invasive screening test to evaluate the fetal health and to predict the perinatal outcome. Incidence of high caesarean rate, Meconium stained liquor, low apgar score, NICU admission and perinatal moratlity was more frequent in those cases that have abnormal CTG traces.

Keywords: CTG; Abnormal Cardiotocography; Apgar score and Perinatal Outcome.

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Introduction

Surveillance of the foetus during labour is important to ensure the delivery of a healthy baby in good condition with the minimum of intervention [1]. Although, the vast majority of foetuses cope well during labour, the journey through the birth canal is stressful and the foetus may mount a 'stress response'. Foetuses with utero-placental insufficiency develop hypoxia in labour that may be acute or sub-acute. Some foetuses may be hypoxic prior to entering labour. Foetal monitoring during labour identifies the foetuses at risk of hypoxic damage, so that appropriate intervention could be instituted to optimise perinatal outcome. Such an approach is introduced to prevent neurological injury, including cerebral palsy [2].

Intermittent auscultation, continuous electronic fetal heart rate (FHR)

monitoring and invasive techniques like fetal blood gas analysis are the available methods for such a surveillance [3]. Cardiotocography is most diffused, non invasive pre-natal diagnostic technique to monitor foetal health during labour. Although with intermittent auscultation the baseline foetal heart rate (FHR) can be measured, other features of the foetal heart such as baseline variability, accelerations and decelerations are difficult to quantify [4].

CTG is a test that graphically records the fetal heart activity and uterine contractions, simultaneously and continuously, in the same time scale, with fetal movements [5]. The fetal heart rate is obtained via an ultrasound transducer attached to the maternal abdomen. A tocotransducer can also be attached to the maternal abdomen to detect the uterine activity. Both transducers are connected to a cardiotocography machine which produces a two channel recording on thermal paper, available for interpretation and storage. It is generally agreed that the CTG has a predictive value for fetal outcome and several studies have shown a low false negative rate.

The Admission test, first described by Ingemarsson et al. [6] short strip (20 minute) of CTG done during labour. It is a dynamic screening test for the state of oxygenation of the fetus on admission of the mother into labour room placental reserve by checking the response of the fetal heart during the phase of temporary occlusion of the uteroplacental blood supply under physiological stress of repeated uterine contractions. It thereby assesses the ability of the fetus to withstand the process of labour. Therefore based on assumption that early uterine contractions may serve as a functional stress to the fetus, an admission test might detect fetal intrauterine hypoxia present already at admission and might have some predictive value of asphyxia that might develop in early labour.

Objective of Study

To correlate abnormal cardiotocographic pattern and perinatal outcome.

Materials and Methods

The study was carried out on 200 pregnant women admitted for delivery at the Labor and maternity ward, department of obstetrics and gynaecology in our teaching institute. It was a prospective, cross-sectional study. Written informed consent was obtained from the women who participated in the study. Ethical approval for the study was obtained from ethical committee of the institution.

Inclusion Criteria

Women with singleton pregnancy with a period of gestation >37 weeks, in first stage of labor with fetus in cephalic presentation

Exclusion Criteria

Women who were excluded from the study were period of gestation <37 weeks, any evidence of risk factor/obstetric complication on admission (pre-eclampsia, diabetes-overt or gestational, suspected intrauterine growth restriction (IUGR), multiple pregnancies, abnormal lie and presentation, patients those who were identified for elective lower segment caesarean section (LSCS) like previous caesarean section, ultrasonography (USG) confirmed lethal congenital anomaly of fetus, acute hypoxic states like abruption of placenta, cord prolapse, uterine scar rupture etc.

Procedure of the study

On admission, women's detail history including age, parity, antenatal care, menstrual, obstetric and medical history were documented. General physical examination was done. Per abdominal and bimanual examination were performed to determine the stages of labor, following which CTG was done. A tracing was taken for 20 minutes. The FHR traces thus obtained were categorized as reactive, equivocal or ominous as according to the classification proposed by NICE (National Institute of Clinical Excellence- Clinical guideline September 2007) [5].

The FHR patterns are classified as follows

FHR feature	Baseline (bpm)	Variability (bpm)	Decelerations	Accelerations
Reassuring	110-160	≥5	None	Present
Non-reasssuring	100-109 161-180	<5 for 40-90 minutes	Typical variable decelerations with over 50 % of contractions, occurring for over 90minutes Single prolonged deceleration up to 3 minutes	The absence of accelerations with otherwise normal trace is of uncertain significance
Abnormal	<100 >180 Sinusoidal pattern ≥10 minutes	<5 for 90 minutes	Either atypical variable decelerations with over 50% of contractions or late decelerations, both for over 30 minutes Single prolonged decelerations for more than 3 minutes	

The CTG patterns were categorized as follows

Category	Definition
Normal	An FHR trace in which all four features are classified as reassuring
Suspicious	An FHR trace with one feature classified as non-reassuring and remaining features classified as reaasuring
Pathological	An FHR trace with two or more features classified as non-reassuring or one or more s classified as abnormal

If the CTG trace was found to be equivocal, the test was continued for 40 minutes to rule out sleep pattern.

Also certain measures such as changing maternal position, treating hypotension or pyrexia, hydration, reducing or stopping oxyocin or tocolysis for hyperstimulation were taken when CTG changes were observed.

The CTG patterns obtained were then followed up with special reference to:

1. Gestational age
2. Mode of delivery
3. Meconium stained liquor
4. Apgar score
5. Admission to NICU-perinatal morbidity and mortality

At the time of delivery, following data variables were collected:

1. The pattern of CTG tracing whether Normal/ Abnormal/suspicious were noted
2. Based on FHR abnormalities in CTG during labor, cases were followed up for the mode of delivery-Normal vaginal/instrumental/ emergency cesarean section
3. In the event rupture of membranes (spontaneous or artificial), colour of liquour during labour was looked for normalcy or meconium stained
4. The one minute and 5 minute Apgar score was determined by a paediatrician.

Statistical Analysis

Data obtained from the study groups were analyzed and statistically verified by nonparametric Chi-square test with the use of computer software SPSS V16.0. Statistical significance was calculated between normal, abnormal and suspicious groups where ever possible. A p-value of < 0.05 was considered as the definition of statistical significance.

Results and Analysis

The study includes 200 pregnant women admitted in the Labor and maternity ward, department of obstetrics and gynaecology of our teaching institute. It was a prospective, cross-sectional study. The results were analysed as follows.

In women with normal CTG patterns, 61.18% had normal vaginal delivery; 6.5% had instrumental delivery and 32.2% underwent LSCS.

Table 1: Distribution of cases according to Maternal age

Maternal age	Frequency	Pecentage
17-20 years	77	38.5
21-25 years	71	35.5
26-30 years	49	24.5
31-35 years	3	1.5
Total	200	100

In the present study, majority (38.5%) of the pregnant women belonged to less than 20 years

Table 2: Distribution of cases according to parity

Parity	Frequency	Percentage
Primi	127	63.5
Multi	73	36.5
Total	200	100

In the present study, 63.5% of women were primigravidae and 36.5 % were multigravidae.

Table 3: Distribution of cases according to gestational age

Gestational age	Frequency	Percentage
37 weeks	63	31.5
38 weeks	115	57.5
39 weeks	13	6.5
40 weeks	6	3
41 weeks	3	1.5
Total	200	100

57.5% of the women in this study had 38 weeks of gestation, 31.5% had 37 weeks of gestation and 6.5% had 39 weeks of gestation.

Table 4: Distribution of cases according to CTG findings

Cardiotocographic Findings	Frequency	Percentage
Normal	152	76
Abnormal	18	9
Suspicious	30	15
Total	200	100

In the present study, 76% had normal CTG patterns, 9% had abnormal patterns and 15% had suspicious CTG patterns

Table 5: Comparison of CTG findings with mode of delivery

Cardiotocographic Findings	Mode of delivery			Total n(%)
	Vaginal delivery N (%)	Intrumental delivery N (%)	LSCS N (%)	
Normal	93(61.18)	10(6.5)	49(32.2)	152(100)
Abnormal	2(11.1)	3(16.66)	13(72.2)	18(100)
Suspicious	13(43.3)	3(10)	14(46.6)	30(100)
Total	108(54)	16(8)	76(38)	200(100)

x^2=17.909 df=4 P=0.001<0.05 Highly significant

Table 6: Comparison of CTG findings with meconium stained liquor

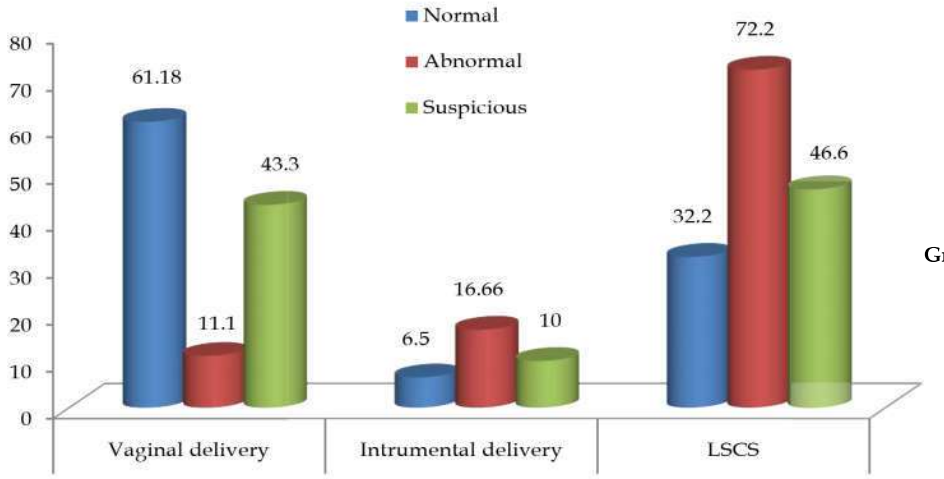
Cardiotocographic Findings	Meconium stained liquour		Total n(%)
	Absent n (%)	Present n(%)	
Normal	145(95.39)	7(4.6)	152(100)
Abnormal	13(72.2)	5(27.7)	18(100)
Suspicious	26(86.6)	4(13.3)	30(100)
Total	184(92)	16(8)	200(100)

x^2=13.106 *df*=2 *P=0.001<0.05 Highly significant*

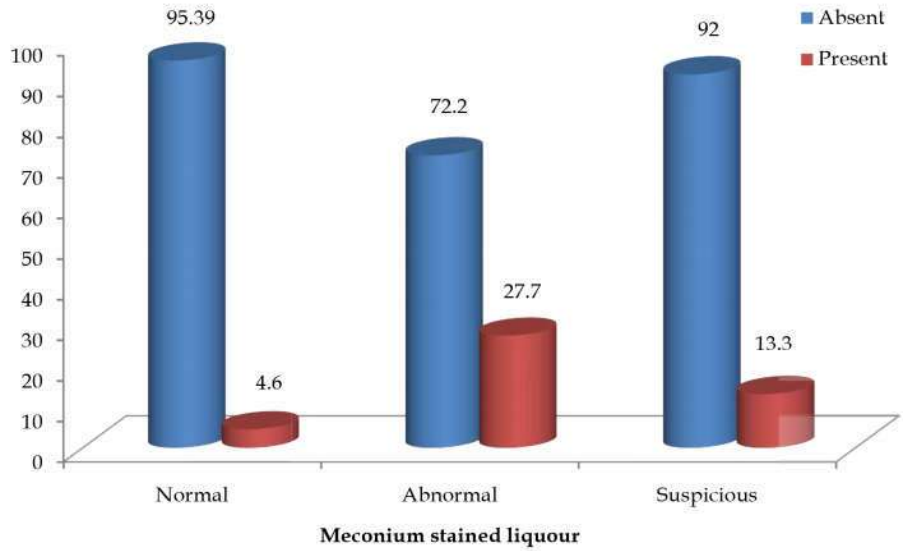
In those with abnormal CTG patterns, 11.1% had normal vaginal delivery; 16.66% had instrumental delivery and 72.2% underwent LSCS. (Table 5)

In those with suspicious CTG patterns, 43.3% had normal vaginal delivery; 10% had intrumental delivery and 46.6% underwent LSCS (Graph 1).

In the present study, 27.7% with abnormal CTG patterns had meconium stained liquor during the labour when compared to 4.6% of the women with normal CTG and 13.3% with suspicious trace patterns (Graph 2).



Graph 1:



Graph 2:

Cardiotocographic findings showed abnormal patterns in 22.2% of women with loops of cord around baby's neck as compared to 3.94% of normal CTG pattern group and 20% of suspicious group (Graph 3).

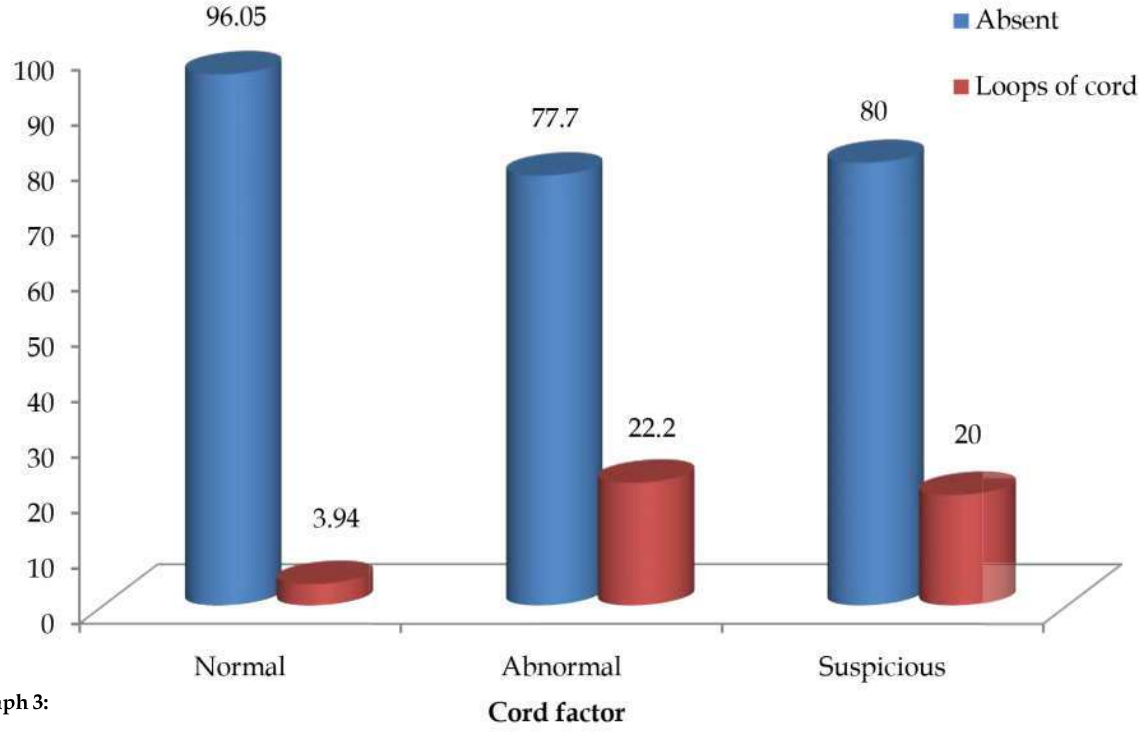
94.73% of babies born to mothers with normal CTG findings had Apgar score >7 and 5.26 % had Apgar score <7.

72.2% of babies born to mothers with abnormal CTG findings had Apgar score >7 and 27.7% had Apgar score <7.

Table 7: Comparison of carditocographic findings with loops of cord

Cardiotocographic Findings	Cod factor		Total
	Absent N (%)	Loops of cord N (%)	N (%)
Normal	146(96.05)	6(3.94)	152(100)
Abnormal	14(77.7)	4(22.2)	18(100)
Suspicious	24(80)	6(20)	30(100)
Total	184(92)	16(8)	200(100)

x^2=14.208 *Highly significant*



Graph 3:

Table 8: Comparison of carditocographic findings with Apgar score

Cardiotocographic Findings	Apgar score at 5 mts		Total N (%)
	>7 N (%)	<7 N (%)	
Normal	144(94.73)	8(5.26)	152(100)
Abnormal	13(72.2)	5(27.7)	18(100)
Suspicious	26(86.6)	4(13.3)	30(100)
Total	184(92)	16(8)	200(100)

x^2=11.550 *df*=2 *P=0.003<0.05 Highly significant*

Table 9: Comparison of CTG findings with NICU admission

Cardiotocographic Findings	NICU admission		Total N (%)
	No N (%)	Yes N (%)	
Normal	150(98.68)	2(1.31)	152(100)
Abnormal	12(66.6)	6(33.3)	18(100)
hSuspicious	27(90)	3(10)	30(100)
Total	189(94.5)	11(5.5)	200(100)

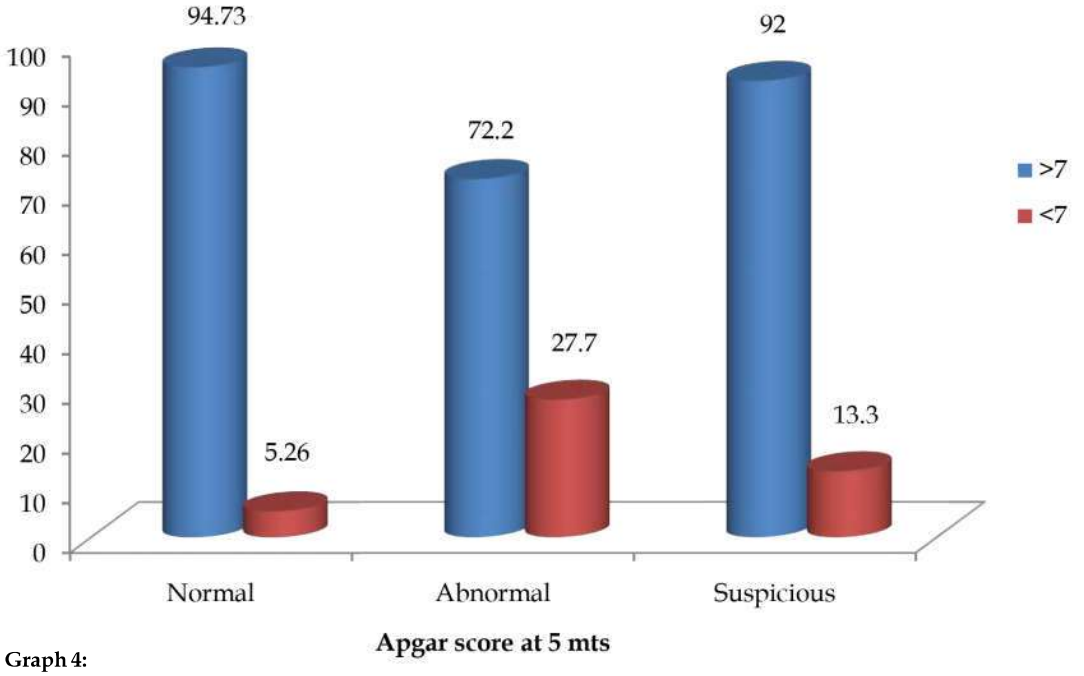
x^2=33.118 *df*=2 *P=0.000 <0.05 Highly significant*

86.6% of babies born to mothers with suspicious CTG findings had Apgar score >7 and 13.3 % had Apgar score <7.

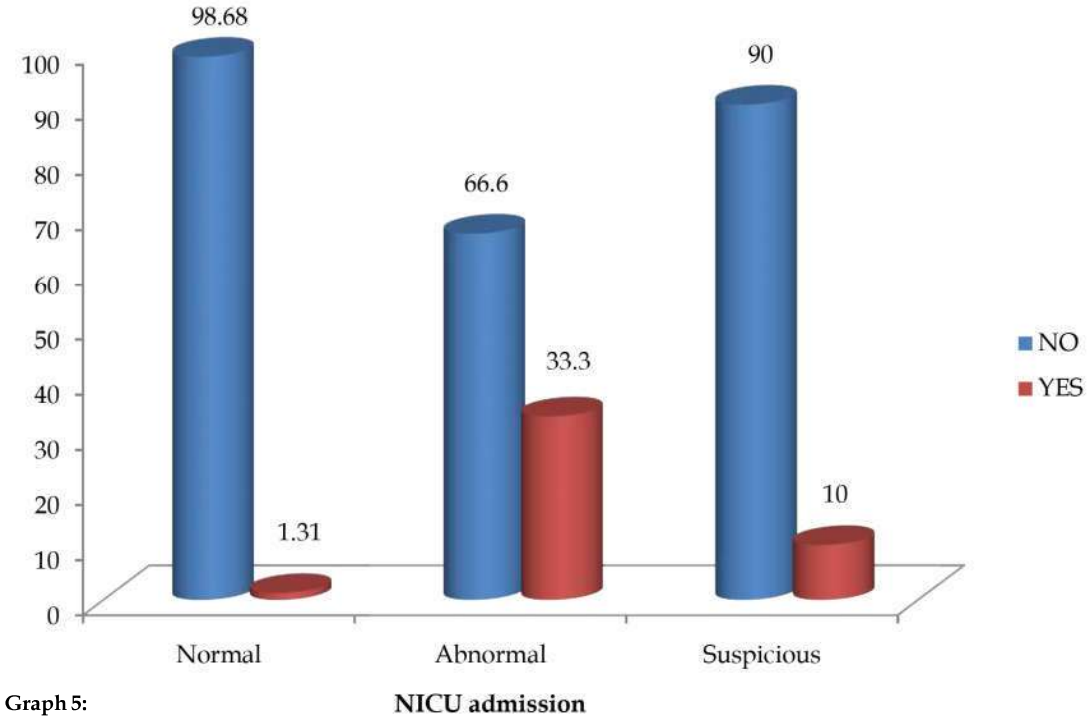
Low Apgar scores were commonly associated with abnormal CTG findings (Graph 4).

NICU admissions were 33.3% with abnormal CTG patterns when compared to 1.31% with normal CTG results and 10% with suspicious results (Graph 5).

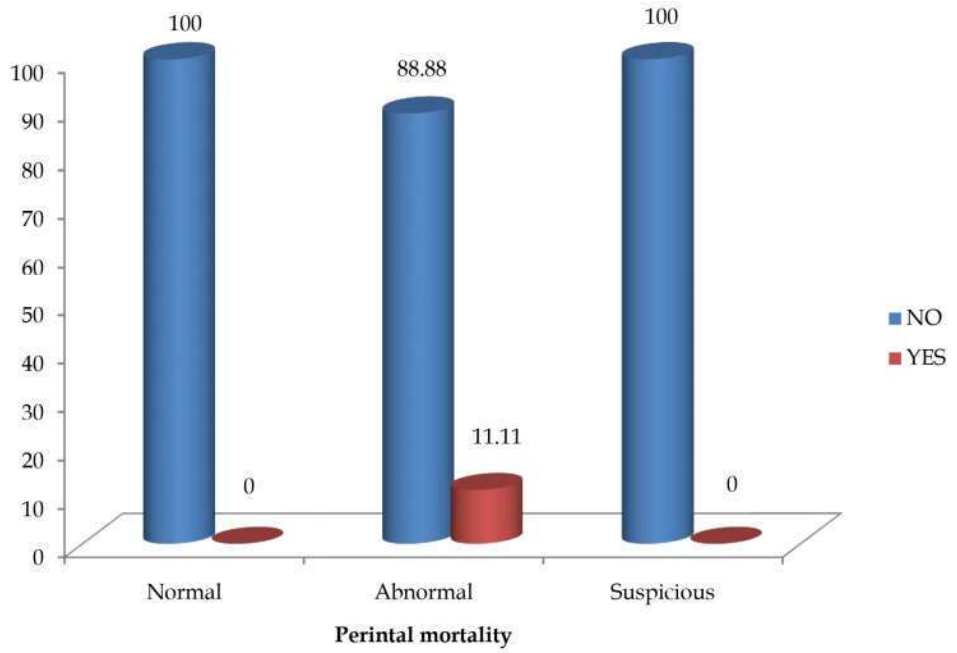
Peinatal deaths encountered in 11.11 % of the newborns born to women with abnormal CTG (Graph 6).



Graph 4:



Graph 5:



Graph 6:

Table 10: Comparison of CTG findings with perinatal moratlity

Cardiotocographic Findings	Perintal mortality		Total N (%)
	No N (%)	Yes N (%)	
Normal	152(100)	0	152(100)
Abnormal	16(88.88)	2(11.11)	18(100)
Suspicious	30(100)	0	30(100)
Total	198(99)	2(1)	200(100)

x^2=20.426 *df*=2 *P=0.000 <0.05 Highly significant*

Discussion

CTG is a dynamic screening test for the state of oxygenation of the foetus during labour. It assesses the placental reserve by checking the response of the foetal heart during the phase of temporary occlusion of the utero-placental blood supply under physiological stress of repeated uterine contractions. It thereby assesses the ability of the foetus to withstand the process.

In our study, 38.5% of the women in the study group belonged to less than 20 years. 63.5% of women were primigravidae and 36.5% were multigravidae. 57.5% of the women in this study had 38 weeks of gestation, 31.5% had 37 weeks of gestation, 6.5% had 39 weeks of gestation, 3% had 40 weeks of gestation and 1.5% had 41 weeks of gestation.

Table 11: CTG findings

Study	No	CTG findings		
		Normal N (%)	Abnormal N (%)	Suspicious N (%)
Present Study	200	152(76%)	18(9%)	30(15%)
Sandhu et al [3]	150	101(67%)	15(10%)	34(23%)
Rahaman et al [8]	160	123(76.9)	14(8.7%)	23(14.4%)
Vijay Nikita et al [9]	100	77(77%)	3(3%)	20(20%)

Table 12: Comparison of CTG findings with mode of delivery

Study	Present study			Khurseed et al [10]		Rahaman et al [8]			Vijay Nikita et al [9]		
Mode of delivery	VD	ID	LSCS	VD	LSCS	VD	ID	LSCS	VD	ID	LSCS
Normal	61.1%	6.5%	32.2%	62.57%	37.43%	52.8%	11.4%	35.8%	89.6%	2.6%	7.8%
Abnormal	11.1%	16.6%	72.2%	27.27%	72.23%	14.3%	7.1%	78.6%	---	33.3%	66.7%
Suspicious	43.3%	10%	46.6%	-	-	52.2%	4.3%	43.5%	45%	15%	40%

In the present study, 72.2% underwent LSCS which is comparable to other studies by Khurseed et al. [10], Rahaman et al. [8] and Vijay Nikita et al. [9]

Table 13: Comparison of CTG findings with meconium stained liquor

CTG Trace	Present study	Khurseed et al [10]	Rahaman et al [8]	Vijay Nikita et al [9]
Normal	4.6%	16%	9%	3.9%
Abnormal	27.7%	27.3%	72%	33.33%
Suspicious	13.3%	56.7%	39%	25%

The present study had 27.7% incidence in meconium stained liquor during labour in women with abnormal CTG patterns which is comparable to the studies by Khurseed et al. [10] and Vijay Nikita et al. [9].
However, study done by Rahaman et al. shows 72% incidence in meconium stained liquor in abnormal CTG traces. This is due to difference in case difference in case selection where all high risk patients were included in the study.

Table 14: Comparison of CTG findings with NICU admission

CTG Trace	Present study	Sandhu et al [3]	Khursed et al	Rahaman et al [8]	Vijay Nikita et al [9]
Normal	1.31%	1%	16.9%	6.5%	1.3%
Abnormal	33.3%	33.3%	30.6%	57.1%	66.67%
Suspicious	10%	12%	52.5%	26.1%	15%

In this study, 1.2% of babies were born to mothers with normal CTG and 30.9% of babies with abnormal CTG. This is comparable to the study by Sandhu et al. [3].
There is a high (57.1%) incidence in NICU admission in Rahaman et al. [8] study (57.1%)and Vijay Nikita et al. [9] study (66.67%).

Table 15: Perinatal mortality

CTG Trace	Present study	Sandhu et al [3]	Rahaman et al [8]	Vijay Nikita et al [9]
Normal	Nil	Nil	Nil	Nil
Abnormal	11.11%	6.6%	7.1%	33.33%
Suspicious	Nil	Nil	4.3%	Nil

The abnormal CTG patterns of the present study had 11.11% perinatal mortality where as Sandhu et al. [3] study had 6.6%, Rahaman et al. [8] study had 7.1% and Vijay Nikita et al. [9] had 33.33% perinatal mortality

Conclusion

The cardiotocography test is a simple, noninvasive, inexpensive test for antepartum and intrapartum fetal surveillance. It is easy to perform and causing no inconvenience or complications to the patient. Our study has shown that abnormal CTG is an alarming sign for active intervention because those who have abnormal CTG associated with poor maternal and neonatal outcome in terms of mode of delivery, meconium stained liquor, low Apgar scores, admission to NICU and perinatal mortality. Finally conclude that CTG test is a very useful prognostic tool in predicting perinatal outcome.

References

1. Whittle MJ, Martin WL. Turnbull's obstetrics. London: Churchill Livingstone; monitoring in labor. In: Chamberlain G, steer P, editors. 2001.
2. Chandraharan E, Sabaratnam A. Electronic foetal heart rate monitoring in current and future practice. J Obstet Gynecol India. 2008;58(2):121–30.

3. Sandhu, VSM, Raju R, Bhattacharyya TK, Shaktivardhan, Admission Cardiotocography Screening of High Risk Obstetric Patients. *MJAFI* 2008;64:43-45.
4. Gibb D, Arulkumaran S. Oxford: Boston: Butterworth-Heinemann; The admission test: Clinical scenarios Foetal monitoring in practice. 1997.pp.67–72.
5. Blix E, Reine L M, Klovning A, Oian P. Prognostic value of the labour admission test and its effectiveness compared with auscultation only : A systematic review. BJOG 2005;112:1595-1604.
6. Ingemarsson I, Arulkumaran S, Ingemarsson E, Tambyraja RL, Ratnam SS. Admission test: a screening test for fetal distress in labour. Obstet Gynecol 1986;68:800-806.
7. National Institute for health and clinical excellence, NICE Clinical guideline 55Intrapartum care, September 2007:44-5.
8. Rahman H, Renjhen P. Dutta S, Kar S, Admission cardiotocography:Its role in predicting fetal outcome in kigh risk obstetric patients, Australian Medical Journal, 2012;5(10):522-7.
9. Vijay Nikita, Kumare Bhavana ,labour Admisg perinatal outcomesion Test as Predictor of Intrapartum Fetal distress, Panacea Journal of Medical Sciences, 2016 Jan-Apr;6(1).
10. Khurseed F, Das CM, Jatori N, Cardiotocography: Obstetric and Neonatal outcome, Journal of Rawalpindi Medical college, 2009;13(2):86-88.